Table 2. Chemical Agent Multi Media/Toxicity Exposure Standards and Guidelines Summary Table: Existing Values as of Mar 2006 ; POC V. Hauschild 410-436-1010

Media	Standard Name	Population	Exposure Scenario	H/HD/HT (Mustard)	GA (Tabun)	GB (Sarin)	GD/GF	VX	Lewisite	NOTES/Status
WATER	**FDWS** (Field Drinking Water Standards) ug/L	Designed for military *but can have civilian applications	safe for for up to 7 days:	~~200~~	~~20~~	~~20~~	~~20~~	~~20~~	~~200~~	Old value officially superceded, new version TBMed577 published Dec 2005 (ref a) cites new values which have been endorsed by DoD (see ***ref b***) * See note below (next page)
			Normal/humid climate: 5 L/day	(140) [ab]	(12* [ab])	(12* [ab])	(12* [ab])	(12* [ab])	(80 [ab])	
			Dry climate: 15 L/day	(47 [ab])	(4* [ab])	(4* [ab])	(4* [ab])	(4* [ab])	(27 [ab])	
SOIL (Health-Based Environmental Screening Levels (HBESL) (mg/kg)	**HBESL-Residential**	General population: adults and children	daily exposure, lifetime	0.01 [c,d,e]	2.8 [c,d,e]	1.3 [c,d,e]	0.22 [c,d,e]	0.042 [c,d,e]	0.3 [c,d,e]	HBESLs endorsed by headquarters Army (ESOH) in May 99 **(*ref c*)** were derived (by Army, ***ref d***) using chronic toxicity criteria below with risk assessment model and assumptions like that used by EPA Reg IX to develop soil 'preliminary remediation goals (PRGs). These are conservative screening criteria for assessing potential long term human exposure/contact with soil contaminated from (liquid) agent (ambient vapor alone is not expected to result in deposition or soil contamination). Also identified as criteria to determine public release of decontaminated contaminated items/property (***ref e***). Note that many agent-certified laboratories may not be able to achieve these levels. Also note that were there is potential HD or VX soil contamination, breakdown products may also warrant evaluation (see ***ref d***, App ***F & ref f***).
	HBESL-Industrial	General adult population	frequent exposures 250 days/ yr. for 30 years	0.3 [c,d]	68 [c,d]	32 [c,d]	5.2 [c,d]	1.1 [c,d]	3.7 [c,d]	
WASTE	**$HWCL_{sol}$** [e] (solid hazardous waste control limit) (mg/kg)	worker civilian/ DoD	possible occasional exposure at HW treatment facility	6.7 [g,h]	680 [g,h]	320 [g,h]	52 [g,h]	10 [g,h]	37 [g,h]	Were derived (by Army **– *ref g,h***) using the chronic toxicity criteria below with a risk assessment model similar to that used by EPA Region IX with assumptions denoting specific exposure scenarios associated with waste materials and workers potentially exposed to them (assumes exposures to the general public are controlled). Values were initially documented in a Department of Army proposed hazardous waste management rule presented to the State of Utah (***ref h***) and later in a Oct 2000 CHPPM memo to PMCD (***ref g***) Values were not officially endorsed by Utah but as of June 2004 were **endorsed in DA policy (*ref e*) for site-specific consideration/use.**
	$HWCL_{Liq}$ [e] (liquid hazardous waste control limit) (mg/L)	worker civilian/ DoD	possible occasional exposure at HW treatment facility	0.7 [g,h]	20 [g,h]	8.3 [g,h]	0.3 [g,h]	0.08 [g,h]	3.3 [g,h]	
	NHWCL[e] (non-hazardous waste control limit (haz waste exemption level)[f] (mg/kg)	worker civilian/ DoD	at a non-HW land disposal facility, possible occasional exposures	0.3 [g,h e]	68 [g,h e]	32 [g,h e]	5.2 [g,h e]	1.1 [g,h e]	3.7 [g,h e]	
Chronic Toxicity Reference Criteria (used in risk assessment calculations)	**RfD** (Reference Dose) (mg/kg/day)	General population: adults and children	chronic (lifetime) ingested dose at or below which no adverse health effects are expected	0.000007 i, j, k	0.00004 i, j, k	0.00002 i, j, k	0.000004 i, j, k	0.0000006 i, j, k	0.0001 i, j, k	- NRC/COT (*ref i, 1999*) gave general endorsement of values; addressed in Final DA OTSG endorsement letter of final RfDs (Feb 2000, ***ref j***), most current documentation of basis and overall status of these values is in peer reviewed article: Opresko, et al (***ref k***)
	Cancer Slope Factor) $(mg/kg/day)^{-1}$	General population: adults and children	represents the potency of the agent by ingestion to cause increased cancer risk.	7.7 [i, j, k]	Not determined to be a carcinogen					-The NRC/COT *ref i, 1999* endorsed a less conservative HD Slope Factor of [1.6 $(mg/kg/day)^{-1}$]; DA OTSG (Feb 00) has currently endorsed use of the 7.7; *ref j, ref k*
	Inhalation Unit Risk) $(ug/m^3)^{-1}$	General population: adults and children	represents the potency of the agent by inhalation to cause increased cancer risk	4.1×10^{-3} [i]						See Table 20 HD HCD, Nov 00 *ref l*

Table 2. Chemical Agent Multi Media/Toxicity Standards Status Table: Existing and proposed criteria as of Mar 2006 POC: V. Hauschild, USACHPPM, 410-436-1010

NOTES:

HIGHLIGHTED information indicate noteworthy change/addition from previous version of this Table (other non-substantial clarifying edits not highlighted)

( ) Numbers in parentheses are from draft documents

GREEN Numbers in Green are currently documented in official Army regulation/policy/or through DA Headquarter endorsement

BLUE Numbers have been developed/endorsed by non-DoD federal proponents for Army and non-Army use

RED Numbers are still officially used/endorsed by Army/other approving entity source **but** revisions are proposed/underway

BLACK Numbers black are final technical values but are not officially approved for implementation through a proponent agency

* Application of Drinking water criteria. It is noted that contamination of large water supplies with warfare agents is relatively unlikely due to effects of hydrolysis, dilution, and the neutralizing effects of common water treatment processes *e.g. chlorine). These values were designed for a military scenario, in which smaller containerized water supplies directly used for consumption might be intentionally contaminated with significant amounts of agent. Theoretically this situation could result in residual agent levels of concern for several days. The values here assume up to 7 days exposure at 5-15 liters/day consumption – which is an extremely high rate of drinking based on hot environments and high physical activity. So though these drinking water values were not originally developed for a general population application, they would be appropriate screening levels for even civilian applications where ingestion rates range form 1-2 liters/day and where most releases to a water supplies would involve the hydrolysis, dilution, and treatment processes

REFERENCES:

a) TB Med 577, *Sanitary Control and Surveillance of Field Water Supplies*, December 2005

b) Memorandum, DASG-HS-PE, 16 Apr 1997, Subject: Tri-Service Field Water Standards for Nerve Agents.

c) Memorandum, Headquarters Department of the Army, Office of the Assistant Secretary for Installations, Logistics, and Environment, SUBJ: Derivation of Health-Based Environmental Screening Levels (HBESLs) for Chemical Warfare Agents, May 28 1999.

d) USACHPPM/ORNL Technical Report: *Health-Based Environmental Screening Levels for Chemical Warfare Agents*, , March 99.

e) Department of the Army, Memorandum Subject: *Implementation Guidance Policy for New Airborne Exposure Limits for GB. GA, GD, GF, VX, H, HD, and HT*; signed by Mr. Raymond J. Fatz, Deputy Assistant Secretary of the Army, (Environment, Safety and Occupational Health); OASA(I&E), **June 18 2004**.

f) Munro et al.; *The Sources, Fate, and Toxicity of Chemical Warfare Agent Degradation Products*, Environmental Health Perspectives, Volume 107, Number 12, December 1999 pp933-974

g) Memorandum, Department of the Army – Center for Health Promotion and Preventive Medicine; MCHB-TS-EES; SUBJ: Response to State of Oregon Comments on the Utah Chemical Agent Rule (UCAR), 23 October 2000; NOTE: This response includes **USACHPPM Information Paper *"Management Criteria for Chemical Warfare Agent (CWA)-Contaminated Waste and Media"* 10 October 00 as well as USACHPPM Technical Paper: *"Chemical Warfare Agent Health-Based Waste Control Limits"*, dated September 2000.**

h) U.S. Army –Proposed Utah Chemical Agent Rule (UCAR), May 1999 (Volume 1, Section XI. Development of Health-Based Waste Management Concentration Levels."

i) *Review of the U.S. Army's Health Risk Assessments for Oral Exposure to Six Chemical-Warfare Agents*, National Research Council, National Academy Press, WashDC, 1999; www.nap.edu

j) Memorandum, (Army OTSG) MCHB-CG-PPM, Chronic Toxicological Criteria for Chemical Warfare Compounds, 16 February 2000.

k) Opresko, D.M, et all, 2001. Chemical Warfare Agents: Current Status of Oral Reference Doses, *Reviews of Environmental Contamination and Toxicology Vol 172, pp 65-85.*

l) USACHPPM Technical Report: *Evaluation of Airborne Exposure Limits for Sulfur Mustard (HD): Occupational and General Population Exposure Criteria*, Technical Report 47-EM-3767-00**,** November, 2000